NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

COMPOSTING FACILITY, (NUMBER)

Code 317

DEFINITION

This is a treatment component of an agricultural management system for the biological stabilization of organic material.

PURPOSE

To reduce the pollution potential of organic agricultural wastes to surface and ground water.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where:

- Organic waste material is generated by agricultural production or processing;
- A composting facility is a component of a planned agricultural waste management system; and,
- A composting facility can be constructed, operated and maintained without polluting air and/or water resources;
- Animal mortality management is a component of a planned agricultural waste management system.

FEDERAL, STATE, AND LOCAL LAWS

This standard is in addition to all federal, state and local laws governing waste management, pollution abatement, and health and safety. The owner shall be responsible for obtaining all required permits and for performance in accordance with such laws and regulations. Certification of compliance with this standard and specification DOES NOT insure compliance with other federal, state, or local requirements.

Any work involving the discharge of dredged or fill material into wetlands or other waters of the United States may require a permit according to Section 404 of the Clean Water Act.

PLANNING CONSIDERATIONS

Location. Locate composting facilities as near to the source as practical where prevailing winds, vegetative screening, and building arrangement minimize odor and visual resource problems. Consideration shall be given to the effect on soil, plant, animal, air and water resources.

Types. Four types of composting operations are covered in this standard – aerated windrows, composting binds, static piles and in-vessel.

Aerated windrows are suited to large volumes of organic material. Composting bins may be used for both large and small volumes of organic material. Periodic turning re-aerates the material, promoting the composting process.

Organic material in static piles is initially mixed to a homogeneous condition and not turned again throughout the composting process. Static pile material must have the proper moisture content and bulk density to facilitate air movement throughout the pile. Forced air might be necessary to facilitate the composting process. In-vessel composting in a totally enclosed structure is carried out on a blended organic material under conditions where temperature and airflow are strictly controlled. In-vessel materials are usually

turned once to facilitate the process. Vessel dimensions must be consistent with equipment to be used for management of compost.

Process. Composting is accomplished by mixing an energy source (carbonaceous material) with a nutrient source (nitrogenous material) in a prescribed manner to meet aerobic microbial metabolic requirements. The process is carried out under specific moisture and temperature conditions for a specified period of time. Correct proportions of the various compost ingredients are essential to minimize odors and to avoid attracting flies, rodents, and other small animals.

Carbon Source. A dependable source of carbonaceous material must be available. The material should have a high carbon content and high carbon to nitrogen ration (C:N). Wood chips, sawdust, peanut hulls, straw, corncobs, bark, peat moss, and well-bedded horse manure are good sources of carbon.

Moisture Control. Large amounts of water are lost during the composting process because the higher operating temperatures evaporate the water. The availability of water should be considered for compost pile moisture control from start-up through completion. Proper moisture facilitates the composting process and helps control odors.

Equipment Needs. Appropriate equipment must be available for initial mixing, turning, and hauling composted material and carbonaceous material. Appropriate long stem thermometers should be available for managing the composting material.

Bulking Materials. Bulking materials may be added to enhance airflow within the composting material. Piles that are too compact will inhibit the composting process and may become anaerobic and odorous. The carbonaceous material can be considered as a bulking agent.

Economics. Benefits associated with the ultimate use of the composted material should be compared to the capitol expenditure and operation costs of the composting operations. In addition to cost return, benefits can include environmental protection, improved handling, disposal of dead poultry and other farm animal carcasses, odor control and reduced need for storage volume.

Compost Utilization Plan. Due to the nutrient content of the compost residual, a compost utilization plan shall be developed, which will account for the use of the compost material.

CRITERIA

Soils. Locate composting facilities on soils having slow to moderate permeability to minimize seepage of dissolved substances into the soil profile and moving toward groundwater. Evaluate site paving needs in terms of effects of equipment operation on trafficability, soil compaction and potential for contamination from compost and petroleum products.

Runoff. Divert surface runoff from outside drainage areas around the compost facility. Any leachate shall be captured and contained. If the compost facility is unroofed, contaminated runoff shall be properly managed. The composting facility shall be protected from inundation or damage from a 25-year, 24-hour frequency flood event.

Facility Size & Storage. Where dead poultry and other small farm animals are composted, establish the size of the primary composting units on the basis of containment period, normal mortality, number, size, and type of animals. (See Chapter 10, AWMFH). The minimum volume required for the secondary stage shall equal the volume of the primary stage. The dead animal composter shall be designed to facilitate transfer of compost material from the primary stage to the secondary stage.

The primary stage will require multiple bins to properly load, monitor, and turn the compost. The dimensions of the facility shall be dependent on the materials used to build the bins, the reach of the loading and unloading equipment, and the size of this equipment. The height of the bins shall not exceed six feet. The minimum bin width should be more than one foot wider than the equipment used to load and unload the compost material. Provide properly designed storage facilities sized for the appropriate storage period. Protect composted material from the weather by roofs or other suitable covers. All roofs installed to protect compost material should be high enough to accommodate equipment used to load and unload the compost material. Site paving is recommended to prevent soil contamination and to facilitate loading and unloading the bins during all weather conditions. Structures must meet the requirements of Conservation Practice Standard, Waste Storage Facility (313).

OPERATION CRITERIA

Carbon-Nitrogen Ratio. Calculate the amounts of the various ingredients to establish the desired carbon-nitrogen ratio (C:N) of the mix to be composed. The C:N should be between 25:1 and 40:1. Use the higher range of C:N for organic materials that decompose at a high rate (or are highly unstable) with associated high odor production.

Where more than two ingredients are to be blended, the two main ingredients are to be used in the analysis for the desired C:N and mixed accordingly. Adding up to 50 percent by weight of other ingredients to improve workability and air movement is permissible as long as the C:N of the added ingredient does not exceed the target C:N of the compost.

Odor. Select carbonaceous material that, when blended with the nitrogenous material, will result in the desired pH. The blended material should have a pH at or slightly below 7 (neutral) for best odor control. Where odors do not present a problem, pH of 8 to 9 is acceptable, but strong ammonia and amine related odors would be present for up to the first 2 weeks.

Locate composting operations where movement of any odors toward neighbors will be minimized. Buffer areas, vegetative screens and natural landscape features can help minimize the effects of odors.

Moisture. The moisture content of the blended material at start-up of the composting process should be approximately 60 percent (wet weight basis) and maintained between 40 and 60 percent during the composting process. The composting process may become inhibited when the moisture content falls below approximately 40 percent. Water used for moisture control must be free of deleterious substances.

Pile Configuration. Compost piles for windrowed and static piles should be triangular to parabolic in cross-section form with a base width to height ration of about 2 to 1. Increased surface area favorably affects evaporation and natural aeration and increases the area exposed to infiltration from precipitation in uncovered stacks. Aligning piles north to south and maintaining moderate side slopes maximizes solar warming. Windrows should be aligned to avoid accumulation of precipitation.

Composting Period. The time needed for completion of the process varies with the material and must continue until the material reaches a stability level at which it can be safely stored without creating undesirable odors and poor handling features. Acceptable stability occurs when microbial activity diminishes to a low level. Stability can be obtained in about 21 to 28 days but can require up to 60 days (or more) to produce the desired quality. Visual inspection and regular temperature measurements will provide needed evaluation of the compost status.

Temperature. For best results, operation temperature of the composting material should be 130° F to 170° F once the process has begun. It should reach operation temperature within about 2-7 days and remain elevated for up to 14 days to facilitate efficient composting. The material should remain at or above 110° F for the remainder of the designated composting period.

If the temperature falls significantly during the composting period and odors develop, or if material does not reach operation temperature, investigate the piles for moisture content, porosity and thoroughness of mixing. Compost managed at the required temperatures will favor destruction of any pathogens and weed seeds.

Aeration. Heat generated by the process causes piles to dehydrate. As the process proceeds, material consolidates, and the volume of voids through which air flows decreases. Materials selected for the composting mix should provide for adequate air movement throughout the composting process. Periodically turning the pile and maintaining proper moisture levels for windrows and static piles will normally provide adequate aeration.

Nutrients. Keep compost well aerated to minimize nitrogen loss by denitrification. Keep pH at neutral or slightly lower to avoid nitrogen loss by ammonification. High amounts of available carbon will aid nitrogen immobilization. Phosphorus losses will be minimized when the composting process is managed according to the requirements of this standard. Include the compost nutrients in nutrient management plans and determine the effects of use and management of nutrients on the quality of surface water and groundwater as related to human and livestock consumption.

Testing Needs. Test the compost material for carbon, nitrogen, moisture, and pH if compost fails to reach the desired temperature or if odor problems develop. The finished compost material should be periodically tested for constituents that could cause plant toxicity as the result of application to crops. Composted materials that are prepared for the retail market will require testing for labeling purposes.

PLANS AND SPECIFICATIONS

Plans and specifications shall be prepared in accordance with the criteria of this standard and shall describe the requirements for applying the practice to achieve its intended use.

The following list of Construction Specifications is intended as a guide to selecting the appropriate specifications for a specific project. The list includes most but may not contain all of the specifications that are needed for a specific project:

IA-1 Site Preparation
IA-3 Structural Removal
IA-5 Pollution Control
IA-6 Seeding and Mulching for Protective Cover
IA-11 Removal of Water
IA-21 Excavation
IA-23 Earthfill
IA-24 Drainfill
IA-26 Salvaging and Spreading Topsoil
IA-27 Diversions
IA-31 Concrete
IA-32 Concrete for Nonstructural Slabs
IA-45 Plastic (PVC, PE) Pipe
IA-81 Metal Fabrication and Installation
IA-83 Timber Fabrication and Installation
IA-92 Fences

OPERATION AND MAINTENANCE

The landowner/operator shall be provided a written operation and maintenance plan for the composting component of the waste management system. The plan shall detail capacity of the composter, the mix(es) to be composted, procedures for placing the material in the composter, moisture content of the compost, temperatures to be achieved, monitoring

requirements, schedules for aerating the material, and the utilization of the finished compost. The plan shall also contain inspection and maintenance requirements of the composting facility.